

Toward Digital Equity: Technology Education for Underserved Populations

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Abstract—In this extended abstract/poster, we introduce our work-in-progress project on technology education for underserved populations, particularly for formerly incarcerated women, which is aimed at enhancing digital equity in mid-western states of USA.

Index Terms—Digital Divide; Digital Equity; Technology Education; Underserved Population

TABLE I
BROADBAND USERS IN DIFFERENT COUNTRIES(%) [3].

Year	USA	UK	Japan	S Korea	China	India
2010	77%	81%	77%	81%	34%	9%
2017	81%	89%	93%	85%	55%	35%
2019	89%	94%	94%	93%	58%	41%

I. UNDERSTANDING DIGITAL EQUITY

The evolution of digitization in the society creates disparity in its degree and extent, amongst individuals, households, businesses, geographic areas, and developed vs. developing countries. *Digital divide* refers a gap in access to and usage of information and communication technology between distinct groups based on any criteria such as social and geographical conditions. Traditional measures of digital divide have been focused on the access and connectivity, such as the numbers of Internet subscriptions of households or the available data rate of the users [1]. The main approach to ameliorate the digital divide have been focused on expanding or improving the infrastructure for the Internet either through fixed broadband or mobile cellular infrastructures. For example, Table I shows the percentage of Internet users over the time period in different countries. It shows developed countries now have high percentages of broadband Internet close 90% or above. Meanwhile, India despite of huge progress in recent years, its Internet users are still less than 50%.

While the connectivity infrastructure and the number of users remain as the major measures of digital divide or inclusion, for developed countries

where the Internet penetration rate is close to saturation however, understanding diverse ramifications of digital divide and devising nuanced solutions have become important [4]. Studies show that despite of availability of the Internet and online services, its use and efficacy are not balanced especially for underserved populations such as with conditions of disability, aging, low-income, ethnicity or other socio-economic status [5], [7].

Recognizing the social and cultural aspects of the digital divide is a first step toward *digital equity* and to tackle the *persistent social* inequality concern that goes beyond the basic availability of information and communication technology (ICT). Digital equity is a condition where all individuals and communities have the ICT capacity needed for full civic and cultural participation, employment, lifelong learning, and access to essential services [2]. Understanding the conditions of marginalized/underserved populations and the impact on user behavior, interests, and ability to navigate, evaluate and generate online information would help governments or anchor institutions such as schools, universities and libraries to develop effective and efficient public policy and practice, and educational strategies.

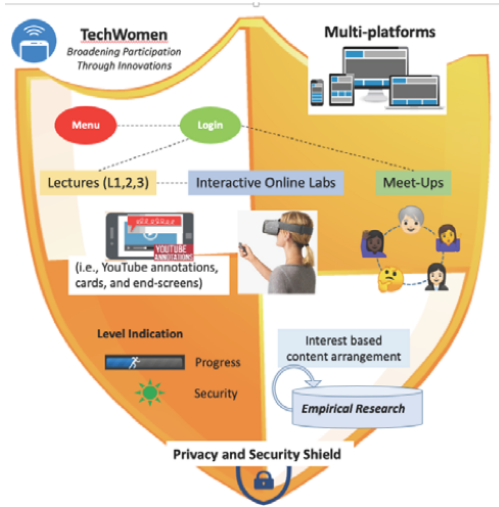


Fig. 1. Mobile Application Architecture Overview

II. TECHNOLOGY EDUCATION FOR FORMERLY INCARCERATED WOMEN

Among underserved groups, we are embarking on a project to enhance knowledge and comfort with technology, and to nurture computational thinking among women who were formerly incarcerated and are now seeking to reenter the workforce or adjust to their lives outside the criminal justice system (*women-in-transition*) in the states of Kansas and Missouri of the United States of America. While women have become the fastest growing segment of the incarcerated population in the United States, prison education and reentry programs are not well prepared to respond to this influx. Women-in-transition rarely have been exposed to solid technology education and they have generally been isolated from the digital world while in prison and consequently face post-incarceration challenges in accessing and using rapidly changing digital technologies.

This informal technology education will be offered through a hybrid format including face-to-face sessions, use of web and mobile applications. Face-to-face technology sessions will be offered weekly at multiple locations of the Kansas City Public Libraries where free public Internet and meeting rooms are available. In addition, to enhance online security and privacy for program participants, which

is an important issue among underserved populations, we will use a secure online community that is available only to our program participants.

A mobile application is an important and integral part of the project for several reasons. According to a recent Pew Research Center report in 2018, 95% of people in the U.S. owned a cellphone of some kind while the smartphone ownership was just 35% in 2011. This recent dramatic growth of the smartphone ownership, along with increases in hardware capacity and software services, has opened new opportunities for boosting efficiency and productivity of mobile applications. Thus, we will develop a mobile learning application to facilitate online tutorials, labs, and meet-ups aimed at enhancing program participants exposure to different types of technologies [9]. Considering their negative collective self-esteem and reluctance in sharing their real identity with others [6], [8], we propose an emoji- or avatar-based meet-up environment in the mobile application. Virtual meet-ups are incorporated to boost a sense of community among program participants. The platform and architecture of our mobile application is depicted in Figure 1. Face-to-face sessions, a member-only online site and an accompanying mobile application for online tutorials and avatar-based virtual meet-ups will enhance exposure to different types of technologies.

III. GOALS OF RESEARCH IN TECHNOLOGY EDUCATION

In parallel with the technology education program, we will conduct empirical social science research, first to inform our technology education program and ultimately to provide insights into informal technology education for underserved populations. Our major educational research objective is to examine how different modalities of offering technology education are associated with learning outcomes of women-in-transition participating in our program. In examining the topic, we will also analyze other related aspects including the association of increasing knowledge and skills in digital technologies with self-efficacy, perceived social support, and employment. We will use a pre-post intervention-based method to collect baseline and follow-up data on participants relevance and ease of use concerning digital technologies and related

data. Technology education methods and research findings from this project will provide important insights to professionals involved in technology education among underserved populations, underserved women in particular. Our web/mobile application to be developed as part of this research should serve as a concrete reference for future efforts to incorporate online learning for digitally disadvantaged populations.

ACKNOWLEDGMENT AND DISCLAIMER

This work is supported in part by the US National Science Foundation under Grant No. 1906795. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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